Trend Study 15-9-99

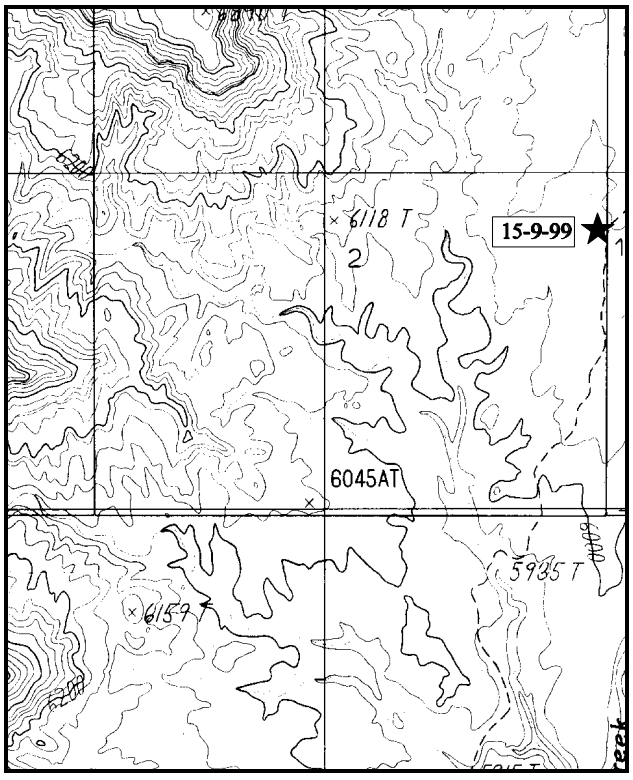
Study site name: Cave Flat Chaining . Range type: Chained, Seeded P-J .

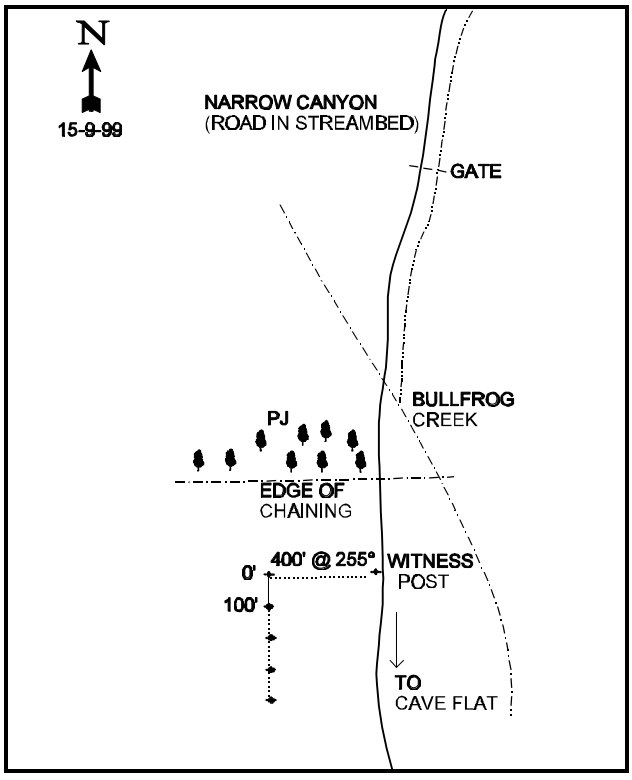
Compass bearing: frequency baseline 165°M.

Footmark (first frame placement) 5 feet, footmarks (frequency belts) line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From Pennellen Pass (T32S, R10E, Sec. 21) drive south for 0.4 miles to an intersection. Stay right towards Airplane Spring and go 3.5 miles to an intersection. Turn left, travel along Bullfrog Creek for 1.35 miles to a gate. Continue past the gate and up out of the creek, going 1.75 miles to a witness post on the right side of the road in the chaining. The transect starts 400 feet west (bearing of 255°M) of the witness post.





Map Name: Cave Flat Diagrammatic Sketch

Township 33S , Range 9E , Section 2 UTM 4201736.395 N, 510761.607 E

DISCUSSION

Trend Study No. 15-9(38-3)

The Cave Flat study is located east of Cave Flat in a pinyon-juniper chaining project that was done on state land by the Division of Wildlife Resources in the fall of 1983. The slope varies from 5-10% on a south-southwest aspect at an elevation of 6,100 ft. This approaches the lower limit of the pinyon-juniper woodland on the west side of the Henry Mountains. Numerous small gullies traverse the chained area. Soil disturbance was higher than normal because of the light sandy loam soil. The site averages less than 12 inches of moisture per year which would make it difficult to successfully treat the site with its associated high amount of sand in the soil. The low level of precipitation and the fact that the seed can easily be planted too deep in the loose sandy soil would also contribute to the low establishment of seeded species.

The area is a key transition area for buffalo as they move off the mountain and out onto Cave Flat and Swap Mesa for the winter. The major reason for chaining this area was to delay buffalo use of the higher elevation seedings by providing additional succulent forage at a lower elevation site. The chaining is within the Steele Butte Allotment and excessive use has been made of the chaining by livestock and buffalo prior to the 1987 reading. Livestock were to be kept off the Cave Flat area beginning in 1988. Pellet transect data from 1999 indicate a moderate level of buffalo use with 47 buffalo days use/acre (116 bdu/ha). Use by livestock is light with 5 cow days use/acre being estimated (12 cdu/ha). Use by deer is currently minimal as no pellet groups were sampled in the 1999 transect counts.

The soil is a sandy loam with numerous rocks on the surface and in the soil profile. A considerable amount of petrified wood is mixed in with the rocks. The soil is loose and easily transported by wind. The soil is slightly alkaline with a pH of 7.7 and has an estimated effective rooting depth of 15 inches. Phosphorus levels (5.8 ppm) are below the minimum of 10 ppm thought necessary for normal plant development. Percent bare ground was quite high since 1987 as on average it is about 40%. Bare ground cover was up again to 43% in 1999. Vegetation and litter both decreased in nested frequency and cover in 1999. Several small gullies are present throughout the site, but due to the gentle terrain, herbaceous and litter cover, and characteristics of the sandy soil, erosion isn't currently a serious problem.

Browse species are not abundant, although a variety of species do occur on the site. Unfortunately, broom snakeweed is the most abundant shrub with an estimated density of 2,666 plants/acre in 1987, and 7,180 in 1994. The population flourished in the years leading up to 1999 with an estimated 21,540 plants/acre. This species has a high biotic potential and recruitment level with an estimated 2,480 seedlings/acre and 5,900 young plants/acre in 1999. The high proportion of seedlings and young in past years have resulted in nearly a 4-fold increase in the number of mature plants at the site. Slenderbush eriogonum is present but represented by small statured plants. Point quarter data estimates 10 surviving pinyon and 16 juniper trees/acre. The average basal diameter of pinyon is just over 2 inches while that of juniper is nearly 5 inches. Thirty percent of the juniper trees are knockdowns from the chaining treatment that are still surviving.

A variety of seeded and native grasses grow on the site. The key perennial grass species are intermediate wheatgrass and crested wheatgrass. Both species increased in quadrat and nested frequency in 1999. Squirreltail, Indian ricegrass, and sand dropseed also exist on the site. However, they are infrequent and decreasing in frequency. Annual grasses, cheatgrass and sixweeks fescue, are also present. Cheatgrass alone accounts for 43% of the total vegetative cover or 60% of the herbaceous cover in 1999. This species is slightly increasing as shown by the increase in nested frequency since 1994, and is found in thick patches throughout the site. Individual cheatgrass plants are short (3 to 6 inches). Sixweeks fescue was sampled in 11 quadrats in 1994, but was not sampled in 1999. However, this species is often difficult to see as it grows under other herbaceous plants in the understory and may still be present. In 1999, cover values for perennial grasses were about half of that in 1994 even with the slight increase in sum of nested frequency. This is a result of the extended drought and dry conditions of the Cave Flat area producing plants that are decreasing in

size. Ten species of forbs were sampled in both 1994 and 1999, but total forb cover is low at less than 2% in 1999 with nested frequency of all forbs decreasing substantially in 1999. The seeded Yellow sweetclover was the most abundant perennial forb encountered in 1987 with a quadrat frequency of 27%. The short lived forb was not seen during the 1994 or 1999 readings. Alfalfa was also seeded and was encountered during both readings, but had a quadrat frequency of only 1% in 1987 and 1994, and was not sampled in 1999. Russian thistle once was the dominate forb at the site, but has since nearly disappeared.

1994 TREND ASSESSMENT

Protective ground cover increased from 57% in 1987 to 66% in 1994. The proportion of bare ground seems high, but due to the gentle terrain and the abundance of herbaceous ground cover, erosion is not currently a problem. Trend for soil is slightly improved. The browse component is not an important aspect on this chaining. The trend for the shrubs which do occur on the site is down primarily due to a significant increase in the density and dynamic biotic and reproductive potentials of the invader broom snakeweed. The dominant grass on the chaining is cheatgrass brome which covers 9% of the ground surface and accounts for 39% of all vegetative cover. Since annual grasses and forbs were not recorded with the old method used in 1987, no comparisons can be made between readings for these species. Seeded grasses, crested and intermediate wheatgrass, have increased in nested frequency since the last reading and perennial grasses as a whole appear to be on the increase. Forbs are not very abundant and the composition is poor. The only seeded forb present is alfalfa with a quadrat frequency of only 1%. Annual forbs dominate and make up 80% of the forb cover. The only annual forb counted in 1987 was Russian thistle. It has nearly doubled in nested frequency since then (76 to 122). Trend for herbaceous understory is stable due to an increase in the sum of nested frequencies for perennial grasses and a decline in perennial forb nested frequencies.

TREND ASSESSMENT
soil - slightly improved, but poor condition
browse - down and dominated by broom snakeweed
herbaceous understory - stable

1999 TREND ASSESSMENT

Trend for soil is stable, but in poor condition. The ratio of bare soil to protective cover is almost the same as 1994 even though bare ground cover increased from 34% to 43% between sampling dates, while vegetation and litter cover both decreased. However, this decrease can be attributed to the extended drought causing plants to be stunted and producing less of a litter build-up. Erosion is still minimal. Browse trend is down as broom snakeweed dominates the site. Recruitment and biotic potential remain high and the population density has tripled over the last 5 years. Herbaceous understory trend is stable, but depleted. Sum of nested frequency for perennial grasses increased while perennial forbs slightly decreased. Cheatgrass is increasing in frequency and is now the most abundant herbaceous species.

TREND ASSESSMENT
soil- stable, but in poor condition
browse- down
herbaceous understory- stable, but depleted

HERBACEOUS TRENDS --
Herd unit 15 , Study no: 9

Type	Species	Nested Frequency '87	'94	'99	Quadrat Frequency '87	'94	'99	Average Cover % '94	'99
G	Agropyron cristatum	38	32	43	15	13	22	2.09	.73
G	Agropyron intermedium	$_{a}$21	$_{b}$127	$_{c}$175	8	45	65	4.76	3.35
G	Aristida purpurea	$_{b}$12	$_{a}$-	$_{b}$3	5	-	3	-	.04
G	Bouteloua gracilis	-	-	1	-	-	1	-	.00
G	Bromus tectorum (a)	-	234	273	-	76	87	8.77	9.21
G	Elymus junceus	-	7	3	-	2	1	.42	.00
G	Oryzopsis hymenoides	$_{b}$25	$_{ab}$16	$_{a}$12	14	7	4	.13	.15
G	Sitanion hystrix	31	40	9	15	14	6	1.25	.22
G	Sporobolus cryptandrus	7	8	6	5	5	4	.16	.04
G	Vulpia octoflora (a)	-	$_{b}$34	$_{a}$-	-	11	-	1.10	-
Total for Annual Grasses		0	268	273	0	87	87	9.87	9.21
Total for Perennial Grasses		134	230	252	62	86	106	8.84	4.56
Total for Grasses		134	498	525	62	173	193	18.72	13.77
F	Astragalus mollissimus	$_{b}$19	$_{a}$6	$_{ab}$16	12	3	10	.04	.15
F	Chaenactis douglasii	$_{a}$-	$_{a}$-	$_{b}$10	-	-	5	-	.07
F	Cryptantha humilis	$_{a}$4	$_{b}$33	$_{ab}$17	3	14	6	.60	.51
F	Descurainia pinnata (a)	-	25	27	-	12	13	.35	.47
F	Erodium cicutarium (a)	-	-	4	-	-	2	-	.03
F	Eriogonum spp.	4	-	-	2	-	-	-	-
F	Holosteum umbellatum (a)	-	4	-	-	2	-	.01	-
F	Lappula occidentalis (a)	-	1	7	-	1	3	.00	.18
F	Lactuca serriola	$_{b}$7	$_{a}$-	$_{a}$-	3	-	-	-	-
F	Melilotus officinalis	$_{b}$60	$_{a}$-	$_{a}$-	27	-	-	-	-
F	Medicago sativa	2	4	-	1	1	-	.00	-
F	Penstemon spp.	$_{a}$4	$_{b}$22	$_{ab}$13	2	11	7	.22	.28
F	Plantago patagonica (a)	-	-	3	-	-	2	-	.01
F	Psilostrophe sparsiflora	2	-	-	2	-	-	-	-
F	Salsola iberica (a)	$_{b}$76	$_{b}$122	$_{a}$2	36	41	1	1.83	.00
F	Streptanthus cordatus	-	3	-	-	1	-	.00	-
F	Townsendia incana	$_{a}$-	$_{ab}$1	$_{b}$10	-	1	3	.00	.04
Total for Annual Forbs		76	152	43	36	56	21	2.20	0.70
Total for Perennial Forbs		102	69	66	52	31	31	0.89	1.06
Total for Forbs		178	221	109	88	87	52	3.10	1.77

Values with different subscript letters are significantly different at % = 0.10

BROWSE TRENDS --
Herd unit 15 , Study no: 9

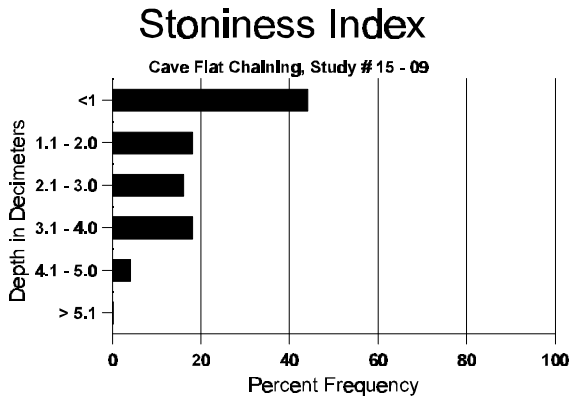
Type	Species	Strip Frequency '94	Strip Frequency '99	Average Cover % '94	Average Cover % '99
B	Chrysothamnus nauseosus graveolens	3	7	-	.15
B	Chrysothamnus viscidiflorus	0	1	-	-
B	Ephedra viridis	1	0	-	-
B	Eriogonum microthecum	20	18	.11	.10
B	Gutierrezia sarothrae	70	93	1.62	5.50
B	Juniperus osteosperma	0	0	-	.00
B	Opuntia spp.	1	0	.03	-
B	Pinus edulis	0	1	.15	-
B	Shepherdia rotundifolia	0	0	-	-
Total for Browse		95	120	1.91	5.77

BASIC COVER --
Herd unit 15 , Study no: 9

Cover Type	Nested Frequency '94	Nested Frequency '99	Average Cover % '87	Average Cover % '94	Average Cover % '99
Vegetation	356	339	2.50	23.29	21.92
Rock	156	92	3.75	4.23	4.46
Pavement	148	123	3.00	.99	1.56
Litter	383	355	47.50	31.52	29.63
Cryptogams	4	17	0	.01	.27
Bare Ground	334	327	43.25	30.29	43.31

SOIL ANALYSIS DATA --
Herd Unit 15, Study # 09, Study Name: Cave Flat Chaining

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
15.1	61.2 (17.1)	7.7	65.3	18.2	16.6	1.2	5.8	128.0	0.6



PELLET GROUP DATA --
Herd unit 15 , Study no: 9

Type	Quadrat Frequency '94	Quadrat Frequency '99	Pellet Transect Days Use/Acre (ha) '99
Rabbit	12	29	N/A
Deer	1	1	0
Cattle	-	13	5 (12)
Buffalo	-	11	47 (116)

BROWSE CHARACTERISTICS --
Herd unit 15 , Study no: 9

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus nauseosus graveolens																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	99	4	-	1	-	-	-	-	-	-	5	-	-	-	100			5
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	27	0
	99	2	2	-	1	-	-	-	-	-	5	-	-	-	100	23	28	5
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	+45%
'94	00%	00%	33%	+70%
'99	20%	10%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	33	Dec:	0%
	'94	60		33%
	'99	200		0%

Chrysothamnus viscidiflorus																		
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	1	-	-	-	-	-	-	-	1	-	-	-	20	3	6	1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	100%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	0	Dec:	-
	'94	0		-
	'99	20		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Ephedra viridis																		
M	87	-	1	1	-	-	-	-	-	-	2	-	-	-	66	15	16	2
	94	-	-	2	-	-	-	-	-	-	2	-	-	-	40	11	23	2
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	20	36	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	50%	50%	00%	-39%
'94	00%	100%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	66	Dec:	-
	'94	40		-
	'99	0		-

Eriogonum microthecum																		
S	87	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	94	4	-	-	-	-	-	-	-	-	4	-	-	-	80			4
	99	8	-	-	-	-	-	-	-	-	8	-	-	-	160			8
Y	87	7	-	-	-	-	-	-	-	-	7	-	-	-	233			7
	94	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
	99	13	-	-	-	-	-	-	-	-	13	-	-	-	260			13
M	87	35	-	-	-	-	-	-	-	-	35	-	-	-	1166	7	6	35
	94	24	6	-	-	-	-	-	-	-	30	-	-	-	600	4	7	30
	99	17	6	-	-	-	-	-	-	-	23	-	-	-	460	3	4	23
D	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	2	-	-	-	-	-	-	-	-	1	-	-	1	40			2
	99	1	1	5	-	-	-	-	-	-	6	-	-	1	140			7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-46%
'94	15%	00%	03%	+ 9%
'99	16%	12%	02%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	1432	Dec:	2%
	'94	780		5%
	'99	860		16%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Gutierrezia sarothrae																		
S	87	155	-	-	-	-	-	-	-	-	155	-	-	-	5166			155
	94	71	1	-	1	-	-	1	-	-	74	-	-	-	1480			74
	99	124	-	-	-	-	-	-	-	-	124	-	-	-	2480			124
Y	87	37	-	-	-	-	-	-	-	-	37	-	-	-	1233			37
	94	154	-	-	-	-	-	-	-	-	154	-	-	-	3080			154
	99	294	-	-	1	-	-	-	-	-	295	-	-	-	5900			295
M	87	43	-	-	-	-	-	-	-	-	43	-	-	-	1433	13	16	43
	94	196	-	-	1	-	-	-	-	-	194	-	3	-	3940	46	39	197
	99	742	20	-	1	-	-	-	-	-	762	-	-	-	15260	7	9	763
D	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	8	-	-	-	-	-	-	-	-	3	-	-	5	160			8
	99	16	2	-	1	-	-	-	-	-	11	-	-	8	380			19
X	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	520			26

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	02%	+63%
'99	02%	00%	.74%	+67%

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	2666	Dec:	0%
	'94	7180		2%
	'99	21540		2%

Juniperus osteosperma																		
S	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33	98	47	1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'87	66	Dec:	-
	'94	0		-
	'99	0		-

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33	4	4	1
	94	1	-	-	-	-	-	-	-	-	1	-	-	-	20	3	14	1
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	11	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	-39%
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	33	Dec:		-
'94	20			-
'99	0			-

Pinus edulis																		
S	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	87	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	33	Dec:		-
'94	0			-
'99	20			-

Shepherdia rotundifolia																		
Y	87	2	-	-	-	-	-	-	-	-	2	-	-	-	66			2
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	87	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	94	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	48	0
	99	-	-	-	-	-	-	-	-	-	-	-	-	-	0	28	35	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'87	00%	00%	00%	
'94	00%	00%	00%	
'99	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
'87	66	Dec:		-
'94	0			-
'99	0			-